DH

DEPARTMENT NATURAL RESOURCES

PHONE : 6-0436

DATE : June 9, 1986

TO : Bill Clapp, Attorney Generals Office
Ron Harnack, Administrator

FROM : Pat Bloomgren, Supervisor
Technical Analysis Unit

SUBJECT : RECONNAISSANCE STUDY OF LAKE TUSTIN

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MPCA, SOLID & HAZ.
WASTE DIVISION

INTRODUCTION

On Tuesday, May 27, in the late afternoon, Bill Clapp called to request assistance in a preliminary assessment of the interaction between ground water and Lake Tustin. The information was needed for clarification of issues regarding potential contamination of Lake Tustin by leachate from the "old Elysian dump." Because the ~~litigation in this matter~~ was ongoing, and because laboratory analyses for some of the chemicals allegedly disposed of in this dump take 4 to 7 days, extensive study (as in a hw site remedial investigation) was not possible. The investigative approach used in this preliminary study was chosen after consultation with staff and with Paul Eger of the Division of Minerals (a member of the remedial investigation and cleanup team for the Department's hazardous waste site at Duxbury).

The three phases of the study included:

1. Survey of specific electrical conductance of lake water adjacent to old dump site and in the lake basin.

2. Mini-piezometer measurements at selected sites by the dump to determine if the ground water level or the lake level is higher. These data reveal the vertical component of the direction of groundwater flow at a given point.

3. Collection of lake water samples near the bottom sediments and field measurement of selected physical and chemical parameters in the lake. Laboratory analysis of the samples will determine:

   macronutrients
   ? chlorocarbon scan
   metals scan
   chloride
   lead
   mercury

Mike-
A meeting has been scheduled w/DNR for Th 6/12 at 3:00pm (in my office) to discuss the Lk Tustin situation — please attend.
Attached is DNR's draft report from their

Field measurements, where appropriate, included:

dissolved oxygen and temperature profiles
specific conductance
pH
Sechi disc depth
total alkalinity
hardness
chloride

The list of parameters was selected during consultation with staff of MPCA. The lab has been notified as further information about chemicals allegedly dumped has become available. Specific analyses now indicated are for 2,4-D, 2,4,5-T, DDT, and PCB's. The lab cannot finish all analyses on all samples in the limited time available, therefore a complete set of analyses on individual samples will be completed in order according to the following priority:

1. Sample site 102: Lake Tustin, from bay over flooded area of old dump.

2. Sample site 101: Wildlife Management Area, surface water from open water area nearest road.

3. Sample site 104: Lake Tustin, ten yards offshore of point where a pile of tires is visible.

4. Sample site 106, also referred to as GW-1: taken from hand-augered hole 8 to 10 feet from lake on point where a pile of tires is visible.

5. Sample site 103: Lake Tustin, fifteen yards offshore of gravel pit, among the farm machinery and other sunken relicts.

Sample sites are designated on the site map.

Work on the first two samples should be completed this week. All other work should be completed within the next few weeks.

Site Surficial Geology

Lake Tustin and the wildlife management area to the south are mapped as part of a glacial outwash channel which extends to the east along the Cannon River flowage. The outwash consists mostly of shallow surficial sands and gravels. The sands and gravels are exposed in a gravel pit at the old dump site and in gravel pits to the east of Lake Tustin. The glacial outwash is often covered by a thin mantle of alluvial material, peat, or silty clay loam. (See Figure 1)

REPORTS OF FIELD WORK

Results of the Conductivity Survey

Conductivity measurements were taken in the area identified on Figure 2. All measured conductance values were within the range of naturally occurring values in a freshwater eutrophic lake.

Results of Mini - Piezometer Work

Mini - piezometer measurements were performed on May 30, 1986 to determine whether ground water is seeping into or out of Tustin Lake along the shore in the vicinity of the old dump site. The mini - piezometer technique has been developed and used successfully by Tom Winter of the United States Geological Survey. The mini - piezometer is a stainless steel tube with a brass screen at its end, and looks like a miniature well point. The piezometer is manually pushed into the sediment near the shore of a lake. The water level in the piezometer tube is compared to the lake level by means of a manometer board. If the lake level is higher than the water level in the piezometer tube, then water is seeping out of the lake along the shore. Conversely, if the lake level is lower than the piezometer water level, then ground water is seeping into the lake along the shore.

It was expected that water is seeping out of Tustin Lake along its south shore, because the water elevation in the Wildlife Management Area to the south is lower than that of Tustin Lake, and also because the elevations of Rays Lake (Charles Lake) and Lake Frances are higher than that of Tustin Lake.

Mini - piezometer measurements were made in three locations: two along the shore of Lake Tustin at the old dump site, and one in the wildlife management area south of Lake Tustin (see Figure 3). At station #1, the piezometer was inserted 6 feet south of the shoreline to a depth of five feet. The lake level was 61 mm higher than the piezometer water level (representing a gradient of 0.040 downward and out of the lake). At station #2, the piezometer was inserted four feet lakeward of shore to a depth of four and one-half feet. The lake level was 131 mm higher than the piezometer water level (a gradient of 0.095 downward out of the lake). At station #3, the piezometer was inserted to a depth of four and one-half feet. The wetland water level was 11 mm lower than the piezometer water level (a gradient of 0.008 upward and into the wildlife management area).

The mini - piezometer measurements show ground water outflow from Tustin Lake along the shoreline in the vicinity of the old dump, and ground water inflow to the wildlife management area. Any potential ground water contamination from the old dump would tend to move away from Tustin Lake.

Ground Water Sample

A ground water sample (#106) was obtained on May 29, 1986, at the end of the point near the old dump site (see Figure 3), about 30 feet from a pile of old tires and other debris. A boring encountered clayey, gray to light brown find sand with a trace of fine gravel. Water was sampled from the open borehole using a decontaminated stainless steel bailer. A 1-liter glass bottle was used for organic analyses, and clean, acid-rinsed Nalgene bottles were used for the filtered and unfiltered samples. The samples were refrigerated for transport to the laboratory.

Surface Water Samples

Surface water samples were obtained on May 29, 1986 from site 101 and on May 30, 1986 from sites 102, 103, and 104 (see Figure 3). These samples were obtained using a Van Dorn water sampler as close as possible to the bottom. In the Wildlife Management Area, this was at a depth of three inches, at the other sites this was at a depth of between three to five feet. The samples were transferred directly from the sampler to decontaminated 1-liter glass bottles. These samples were held at a temperature between 0 and 4 degrees C for transport to the laboratory.

On June 3, 1986 samples were obtained from sites 101, 102, 103, and 104. These samples were obtained using a Kemmerer water sampler as close as possible to the bottom. At site 101 grab samples were taken because of the shallow depth. Filter apparatus and plastic sample containers were clean and acid rinsed. A filtered sample was obtained by filtering through a 0.45 micron pore size membrane filter. The first 50 ml were discarded, then 100 ml were filtered and acidified with trace metals grade concentrated HNO_3 to a pH of less than 2. An unfiltered sample was acidified as described, and a sample tube for ICP analysis was filled with 5 ml sample and 1 ml reagent grade concentrated HCL. These samples were held at a temperature between 0 and 4 degrees C for transport to the laboratory.

Results of Laboratory Analyses

At the close of the work day on Friday, June 6, Mark Briggs reported on the results of chlorocarbon scan for organics. For samples 101 and 102, scan and extractions for 2, 4-D, 2, 4, 5-T, DDT and PCB were completed. Concentrations were at or below detection limits. For samples 104 and 103, scans were completed and no peaks were observed. Time did not permit extractions and analyses for specific contaminants in these samples.

On Saturday, June 7, Gary Zarling reported the results of his work to date on heavy metals.

Lead

filtered samples	101-106	1ppb
unfiltered samples	101	2ppb
	102	4ppb
	103	2ppb
	104	2ppb
"settled" water from	106	22ppb
mixed water - sediment	106	1000ppb

Arsenic

filtered sample	101	19-20ppb
	102	1ppb
	103	2ppb
	104	2ppb
	106	3ppb
unfiltered sample	101	27ppb
	102	2ppb
	103	2ppb
	104	2ppb
	106	5ppb
mixed water - sediment	106	1100ppb

Discussion of Water Quality Results ? RAL = 50 ppb

Samples 101, 102, 103, 104 are all within typical background ranges for concentration of lead as are samples 102, 103, 104 for arsenic. Sample 101 has arsenic concentration of 19-20ppb which is above the state drinking water standard of 10ppb but is less than the federal standard of 50ppb. The concentrations of lead and arsenic in mixed water and sediment in sample 106 are also within the typical concentration of these materials in sediments.

The written lab report will be provided at a later date.

Recommendations for Monitoring

Traditional water quality monitoring would involve establishing sampling stations and taking water samples on a regular basis for a period of time. In this particular case, we would recommend 3 sampling stations:

1. in the Wildlife Management Area in the immediate vicinity of the culvert from Lake Tustin;

2. immediately below the outlet of the Wildlife Management Area in the ditch system;

3. just before the entrance to Lake Tetonka.

We would suggest that samples be analyzed for metals (lead, arsenic and mercury) and scanned for organics. Further work on organics might be necessary if peaks are observed. Samples should be collected and analyzed quarterly provided that water has been discharged through the outlet system.

Henry Quade has suggested that biological monitoring might be used as an alternative to the traditional water sampling approach. Although we have not had time to fully investigate this option, it may have merit. Since ground water flow is from the dump site to the wildlife management area, a series of transects following the water flow could yield valuable information about concentrations of certain contaminants. It may also yield information about the role the wetland plays in cleaning up contamination. The concept is interesting and, if it is shown to be cost-effective, it could be a very valuable analytical tool. Further information would be necessary to determine sampling stations, frequency of sampling and costs.

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